

## Claims

**What is claimed is:**

1. An apparatus for measuring the instability index in a moving web comprising:  
an air pulse for applying a pulse of fluid to the web to create a wave in the web;  
at least two laser displacement transducers for measuring the displacement of the web as the wave moves through the web; and  
a computer which obtains signals from the at least two laser displacement transducers, the computer calculates the instability index in the web based on the speed of the wave in the web and the speed of the web.
2. The apparatus for measuring the instability index in a moving web of claim 1, wherein the air pulse is controlled by the computer.
3. The apparatus for measuring the instability index in a moving web of claim 2, wherein the computer calculates the speed of the web based on signals from the at least two laser displacement transducers.
4. The apparatus for measuring the instability index in a moving web of claim 3, wherein the computer bandpass filters the signals from the at least two laser displacement transducers to eliminate wavelength flutter of the web and then

differentiates the signals to amplify a change in position that is due to the wave passing  
 5 in front of one of the at least two laser displacement transducers.

5. The apparatus for measuring the instability index in a moving web of claim 4,  
 wherein the computer, after differentiating the signals of the at least two laser  
 displacement transducers, obtains the signals and the computer mathematically cross-  
 correlates the resulting output to determine a time delay between the signals, the  
 5 computer uses the time delay between the signals along with the displacement to  
 calculate the speed of the wave.

6. The apparatus for measuring the instability index in a moving web of claim 5,  
 wherein the computer calculates the tension of the web by the following equation:

$$T = BW * (vd+v)^2, \text{ wherein:}$$

T = tension of web,

5 BW = basis weight of web,

vd = wave speed,

v = web speed.

7. The apparatus for measuring the instability index in a moving web of claim 1,  
 wherein the computer calculates the tension in the web while the instability index of the  
 web is greater than about 0.8.